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ABSTRACT

The Federal Institute for Education and Vocational Training Research undertakes research, development, promotion, and counseling work to develop the principles of vocational training provision. Its primary focus has been problems encountered during the transition from vocational training to the labor market. The Institute has been monitoring one series of pilot projects to develop and test training schemes for the long-term unemployed and another series within the framework of a "New Technologies in Vocational Training" program. To apply new technologies in initial and continuing training, the Institute developed and manufactured a computerized numerical control simulator and the appropriate software and instructions on the simulation of milling and turning. Other activities of the Institute include training provision for trainers; the development of training curricula for the metalworking, electrical engineering, and chemical industries and for retailing; evaluation of the usability and applicability of the Institute's findings; implementation of a pilot project series of training programs on the management of technological change; and research into identification of core skills, development of guidelines for safeguarding vocational training provision, and training for ethnic groups and disabled individuals. (YLB)

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IMPACT OF TECHNOLOGY

Results of vocational training research
and development
in the Federal Republic of Germany

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The Federal Institute for Education and Vocational Training Research is required by statute to undertake research, development, promotion and counselling work with a view to further developing the principles of vocational training provision, in particular non-school-based training, specifying the contents and objectives of vocational training and adjusting these to meet changing economic and social requirements.

1. Transition from School to Working Life

In the past, priority here was attached to the problems encountered during the transition from school to vocational training. Since the onset of the decline in the number of school-leavers in the mid-1980s, however, the work of the Institute has been primarily focussed on the problems encountered during the transition from vocational training to the labour market.

The findings of a survey of 10,000 persons who left school in 1984, conducted six months after the date of the final examination as the initial step in a longitudinal study, reveal the following with regard to occupational status:

- 50% of those surveyed have found a permanent job for which, in their estimation, their previous training was a prerequisite; 4% have found a temporary job in line with their previous training.

- 12% have found a permanent job for which their previous training was not a prerequisite; 3% have found a temporary job of this type.

- 13% have enrolled in a further initial training scheme, a continuing training scheme or a retraining scheme.

- 9% are doing military service or are engaged in the community service scheme for conscientious objectors.

- 9% are unemployed six months after completion of training.

At the beginning of 1986, work was completed on a survey following up the 1979 survey project "Acquisition and Utilization of Vocational Qualifications", carried out in cooperation with the Institute of Employment Research. This survey provides up-to-date information on the occupational positions, qualification levels and career profiles of the workforce in the Federal Republic of Germany. Comparison with the 1979 statistics also reveals that structural shifts have taken place.

A further empirical study is exploring the conditions which allow for successful work integration processes following completion of training. It is intended to show how support can be provided for those who have not been able to make the transition from vocational training to employment and also those who wish to return to work after a period of unemployment.

2. Training Schemes for the Long-term Unemployed

Integration or reintegration into working life is particularly difficult for unemployed persons who have no educational or vocational qualification. Without compensatory training their prospects of finding employment are poor if not nil.

Acting on behalf of the Federal Ministry of Education and Science, since 1984 the Federal Institute for Education and Vocational Training Research has been monitoring a series of pilot projects to develop and test schemes to provide compensatory vocational training for adults who have no proper vocational training for various reasons, including social situation, educational deficits, nationality or sex. Of particular significance are the measures developed in connection with the following:

- motivation and orientation measures for the target groups,
- support for the trainees,
- training and continuing training provision for the trainers,
- development of tools and application suggestions for use in the field,
- sociopedagogic support and follow-up support for the trainees.

3. Training Schemes for New Technologies

Again since 1984, the Federal Institute for Education and Vocational Training Research has been acting on behalf of the Federal Ministry of Education and Science to monitor a series of pilot projects within the framework of a "New Technologies in Vocational Training" programme. The research work is intended to explore the implications of microelectronics-induced technological and organizational change for the various sectors of the economy and their job situation and also the new demands made in terms of the skills to be mastered by the workforce; the research is based on the following fields:

- office technology with integrated data and word processing and also integrated information and communication networks;
- control technology and automation for measurement, monitoring and control in manufacturing and also the servicing and maintenance of microprocessor-controlled machinery (SPS);
- computer-aided design and manufacturing (CAD/CAM).

The objective of the project is mainly to develop training course and seminar documentation and the relevant training media. The following outputs are already available:

- manuals for short courses and intensive courses to train skilled clerical personnel for the introduction of microcomputers at the workplace;

- manuals and course modules for initial and continuing training measures for trainees and skilled workers in the electrical and electronics field; description of a hardware configuration;

- CAD/CAM training curricula and media for technical draughtsmen.

With regard to the field of goods management systems, case studies are to serve as the basis for developing proposals for integrating modern information systems into continuing training provision.

4. Application of New Technologies in Vocational Training

With a view to applying new technologies (CNC technology) in initial and continuing training, a CNC simulator was developed and manufactured, together with the appropriate software and instructions for trainers and trainees on the simulation of CNC milling and turning. The simulator allows the trainees to become familiar with practical work at CNC machines. They thereby gain an understanding of the basics of operating and programming the machine.

Currently, a research project is being carried out to explore the training potential offered by the simulator and also the concomitant questions concerning the organization of training and the training of trainers. In

addition to the aspect of training in specialized knowledge and skills, particular interest is being attached to the training potential in terms of aptitudes such as flexibility and cooperation from the work organization viewpoint.

5. Training of Trainers

The activities of the Federal Institute for Education and Vocational Training Research in the field of training provision for trainers proceed from the assumption that what is required here is concrete support material for coping with training problems. Consequently, support material is being developed in connection with innovations in vocational training (e.g. "New Aids for Training at CNC Machines"), and also with the training of young people with social, educational or linguistic deficits. Training aids (seminar design material, training documentation) are to be made available in 1987 on the following subjects:

- Guideline texts: a path towards independent learning;
- Young Turks in vocational training;
- The new occupations in industrial metwalworking;
- Situation-oriented pedagogic training for trainers;
- Creative work assignments to promote motivation and independent action.

Manuals have also been developed on content and methodology for specialized pedagogic training for part-time trainers in retail trading establishments.

6. Development of Training Curricula

The year 1986 saw the completion of the work on the new training specifications for the metalworking, electrical engineering and chemicals industries and for the retail side of commerce. The restructuring of these occupations concerns some 370,000 of a total of approximately 1.8 million training contracts. Today, 1.4 million trainees are being trained in accordance with the updated training specifications.

- The metalworking occupations in the industrial sector have been restructured. 37 metalworking occupations have been replaced by six new metalworking occupations with 17 training profiles. The duration of the training is three-and-a-half years in all cases. All trainees in the new metalworking occupations undergo a joint broad-based, one-year basic training.

- The industrial electrical engineering occupations have been reclassified into four training occupations (previously 12) with eight final qualifications. Here, too, the specialized training follows a period of basic training. The training lasts three-and-a-half years.

- The restructuring of the training occupations in the natural sciences and technical field largely amounted to an updating of the existing occupations. The restructuring was required mainly because of the major changes taking place from both the technological and work organization viewpoints.

- The main new feature in the training for commercial clerks engaged in retail trading is the stronger emphasis on customer counselling, the proper handling of goods in all areas of retail operations, and customer-oriented goods management. For the first time ever, the training contents for the various branches have been laid down in 20 legally binding specialized training curricula.

The concept for restructuring the training occupations "office clerk" and "office assistant", developed on the basis of comprehensive research work, merges the two occupations into a single new occupation requiring a three-year course of training. A two-year period of basic training is followed by a one-year training with emphasis on accountancy and word processing.

The main occupations concerned by the current restructuring activities are metalworking and electrical occupations in the craft sector.

Implementation aids are being developed for trainers affected by the newly structured occupations, with recourse being had here to extensive corporate analyses and expert consultations.

7. Evaluation Methodologies

The work of the Institute is subject to a very particular type of evaluation by the practical work of vocational training itself.

The usability and application of its findings in corporate training operations and vocational training planning are regularly scrutinized by the Management Board, the governing body of the Institute which brings together representatives of the two sides of industry, the governments of the Länder and the Federal Government.

The interim and final results of the Institute's research and development activities are communicated to the public via the media, trainers' seminars, scientific meetings, workshops, symposia and congresses and are discussed with external scientists and practitioners.

In addition, research methodologies, hypotheses and also final reports and their application at practical level are examined within the Institute in presentation sessions, discussion meetings and workshops.

8. Training Programmes on the Management of Technological Change

At the practical, operational level, priority importance is attached to preparing managerial personnel for the new technologies. The above-mentioned pilot project series entitled "New Technologies in Vocational Training" has also demonstrated that modular systems (e.g. fundamentals of programming using a simulator, machinery courses in connection with various manufacturing processes, additional training opportunities such as in didactics, application of NC technology, work preparation and programming) are a particularly suitable approach for use in management training.

In order to support industry, and in particular small and medium enterprises, in introducing modern automation technologies and in training their manpower, the necessary knowledge and skills are to be grouped together according to didactic criteria to form a series of distinct units. These units are intended to serve as orientation aids. With regard to the field of automation technology with special emphasis on handling techniques, the units are being determined and compiled on the basis of expert consultations.

9. Other Major Projects

One priority field of investigation into vocational training provision is that of identifying core skills. Interview studies in selected commercial training occupations are being conducted with a view to identifying the central, core skills with universal applicability throughout the field. Didactic aids will be developed as a follow-up step in this connection.

Another large-scale empirical research project involving analyses of corporate training activities is being conducted to develop guidelines for safeguarding and upgrading the quality of vocational training provision. Here, there is a need to establish the relations between the various factors which contribute to the quality aspect (e.g. production conditions, corporate personnel policy and training motivation efforts, and also the training market situation and the trainees' personal aptitudes). Moreover, research is being conducted to identify the potential and pedagogic limitations of the various training venues. In addition, an analysis is being carried out on potential correlations between training design and the qualification effect sought, this partly with a view to ensuring the more cost-effective deployment of the funds available for vocational training.

In view of the increasing demand for continuing training measures in small and medium enterprises in the wake of the widespread application of modern technologies, work is being carried out to determine the continuing training demand in the energy and environment field on the basis of material analysis, systems studies and expert consultations. Successful continuing training formulae are to be processed for application on a broader scale.

The results of a total of 25 model projects concerning training provision for young ethnics and also those of an empirical investigation into the learning and training process have provided important insights for the development of vocational and prevocational training aids for use with this particular target group.

A further project was carried out to analyse the initial training provision for disabled young people available in corporate and rehabilitation facilities. Proposals were drawn up with a view to upgrading their training prospects; in addition, comparable structure data were examined and proposals discussed for continuing training for disabled adults.

The Institute's permanent activities include analysing statistical data and conducting surveys on the situation with regard to training opportunities. The surveys provide information on, inter alia, corporate attitudes to

the various categories of applicant for traineeships, e.g. girls, persons holding the "Abitur" (offering eligibility for university entrance), etc., and also on young people's behaviour in terms of occupational choice, their attitude towards mobility, etc.

The Institute's activities to support the work of inter-company training facilities have been largely concerned with providing data on capacities and utilization, construction and equipment standards and costs.

10. Priorities for the Future

In addition to discharging its statutory functions, the Federal Institute for Education and Vocational Training Research is also concerned to align its research activities with longer-term considerations. In 1986 the Institute charted out the perspectives for vocational training research over the next ten years. These research perspectives can be classified into the following six fields:

1. Development and determinants of training needs and skill application
2. Educational effect of routine life experience, work and occupation
3. Supply and demand in the field of vocational training
4. Instruments for vocational training design
5. Institutional, organizational and financial aspects of the vocational training system
6. Personnel engaged in vocational training.

Descriptions of these individual research fields will provide the framework for structuring the research programme in the future. Special emphasis in the Institute's current and planned activities is given to:

- learning at the workplace to maintain the link with the practical dimension;
- further upgrading the quality of vocational training provision by:
  - adjusting training contents to changing economic, technological and environmental conditions,
  - upgrading methodologies and progress control procedures,
  - broadening and intensifying the training provision for persons engaged in initial and continuing training,
  - closer cooperation between the various learning venues,
  - defining and testing learning forms, contents, methodologies and progress control procedures;
- coping with the increasing demand for continuing training and ensuring a closer correlation between work and continuing training in terms of both content and organization;
- training young people and adults who are not able to meet the increasingly stringent demands in the education and employment sectors;
- maintaining and broadening the knowledge and skills acquired during initial training with a view to improving prospects on the labour market.